

1 **AN APPLICATOR ASSEMBLY FOR COATING FASTENERS**

2
3 **RELATED APPLICATIONS**

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5 (001) This application is a continuation in part of Applicants' co-pending
6 application Serial No. 10/373,449 An Applicator Assembly For Coating
7 Fasteners by W. T. Mead, et Al., filed February 24, 2003.

8
9 **BACKGROUND OF THE INVENTION**

10
11 Field of the Invention

12
13 (002) The invention relates to the field of paint applicators and, in particular,
14 to an improved applicator for coating the ends of fasteners protruding from
15 structures.

16
17 Description of Related Art

18
19 (003) In aircraft manufacture most structural elements are joined with
20 fasteners. For corrosion protection, the surfaces of these structural elements
21 are coated with a corrosion inhibiting coating. After assembly, the structural
22 elements must also have the fastener ends (with retaining nuts attached)
23 coated corrosion inhibiting coatings. Spraying on coatings can be used.
24 However, the corrosion inhibiting coatings typically contain chromium
25 compounds and the use of such sprays may cause environmental problems.
26 Brushes can be used, but there use is time consuming. Thus the use of roller
27 applicators becomes one of most effective methods from both environmental
28 and time considerations.

1 (004) However, prior art roller designs have not been totally effective. A
2 straight roller will not completely cover the fasteners, especially if they are in
3 rows. US Patent No. 5,410,773 "Pipe Paint Roller" by I. H. Forkner discloses
4 rollers having a U and square shaped notches. These shapes failed to
5 adequately cover in just one pass. In fact, a lot of excess material had to be
6 deposited on the surrounding surfaces before full coverage of the fasteners
7 was accomplished. US Patent No. 2,929,089 "Paint Applicator For Corners"
8 by W. L. Hall disclosed a roller for corners, with a 90-degree V shaped notch.
9 Tests of this design were also unsuccessful. One of the problems was the
10 shape outer edge collapsed under pressure causing too much of the coating
11 to be deposited on the adjacent surfaces. Thus no prior art applicator design
12 can effectively be used to coat fasteners protruding from a surface.

13
14 (005) In addition, it is desirable to eliminate the need for an applicator that
15 does not require that the coating material be imbibed by rolling the coating
16 member in a paint tray. This is a time consuming process. Furthermore, it
17 exposes the user to fumes. Additionally, if the coating material is a two-part
18 system (resin and catalyst) it tends to cure rapidly when exposed to air. Thus
19 once the coating material was poured into the paint tray, it had to be applied
20 immediately.

21
22 (006) Coating material applicators having self-contained supply systems are
23 old in the art. They basically comprised a roller assembly connected by a line
24 to a pump/coating reservoir. Coating flow was controlled by turning the pump
25 on and off. Such systems are difficult to use in confined areas. Examples of
26 this type of applicator can be found in US Patent Publication No. US
27 2003/0021623A1 "Resin Application" by A. R. Harper. The roller handle
28 incorporates a valve to control resin flow to a spreader bar located in proximity
29 to the roller applicator. US Patent No. 2,743,469 "Roller Type Paint
30 Applicators" by F. D. Ditch discloses a paint roller wherein the rod extending

1 from the handle to the roller axle and the roller axle itself are hollow. A valve
2 mounted in the handle controls paint flow, which is distributed from the axle
3 into the interior of the roller.

4
5 (007) There are numerous roller designs wherein the coating material
6 reservoir is contained within the handle. For example, US Patent No.
7 3,337,899 "Roller Type Paint Dispenser" by J. M. Rentfrow discloses a device
8 wherein the rod extending from the handle to the roller axle and the roller axle
9 itself are hollow. A reservoir is incorporated into the handle that incorporates a
10 piston biased by a spring that pressurizes the paint therein. A valve is
11 provided for controlling the flow of paint to the roller. However none of these
12 devices disclose a roller applicator suitable for effectively coating the ends of
13 fasteners protruding from a surface.

14
15 (008) Thus, it is a primary object of the invention to provide a coating
16 applicator for covering the ends of fasteners protruding from a surface.

17
18 (009) It is another primary object of the invention to provide a coating
19 applicator for covering the ends of fasteners protruding from a surface that
20 covers the ends in one pass.

21
22 (010) It is a further object of the invention to provide a coating applicator for
23 covering the ends of fasteners protruding from a surface that covers the ends
24 in one pass while applying a minimum amount of coating material to the
25 adjacent surfaces.

26
27 (011) It is another object of the invention to provide a coating applicator for
28 covering the ends of fasteners protruding from a surface that covers the ends
29 of fasteners, which has a self contained supply of coating material for
30 providing the coating to the applicator for imbibing thereby.

1
2 **SUMMARY OF THE INVENTION**
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4 (012) In applicants' co-pending patent application Serial No. 10/373,449 An
5 Applicator Assembly For Coating Fasteners by W. T. Mead, et Al., filed
6 February 24, 2003 disclosed an applicator assembly for coating fasteners
7 ends protruding from a surface of a structure, the fasteners extending a
8 specific distance above the surface. In general terms, the applicator
9 assembly includes a handle to which a coating member is attached made
10 from open celled compressible foam having a coating transfer surface in a
11 generally W shape. In on embodiment the handle includes an axle. A drum
12 is rotatably mounted to the axle. The coating member is in the form of a ring
13 mounted to the drum, the peripheral surface of the ring having the W shape.
14 This embodiment is suitable for coating rows of fasteners.

15
16 013) Preferably, the central notch of the W shape has and included angle
17 of between 40 and 50 degrees. The depth of the notch is between 65 and
18 85 percent of the specific distance the fastener protrudes from the structure.
19 and the outer surfaces of the W shaped surface extending outward at an
20 angle of between 40 and 50 degrees. The total depth of the coating member
21 must be at least 4 times the depth of central notch. Preferably, the foam is
22 open celled having a density of between 2 and 3 pounds per cubic foot.
23 During coating, such a configuration will allow the coating member to deform
24 sufficiently to completely engulf the fastener end and nut insuring that the
25 imbibed coating material completely coats the fastener end and nut.

26
27
28 (014) The improvement includes attaching a syringe for containing the
29 coating material to the handle of the applicator assembly having a nozzle
30 replacing the needle. The nozzle is positioned such that the tip of just enters

1 the notch and the outlet port of nozzle is aligned with axis of rotation coating
2 member. The advantage of syringe is that coating material remains within the
3 syringe until applied. With the original applicator assembly, a paint tray was
4 necessary. This exposed the operator and any other individuals near by to
5 fumes and possible contact with coating material when handling the tray or
6 pouring coating material therein. In another version, the syringe includes a
7 spring-biased piston, thus pressurizing the coating material. A valve
8 connected to the output port of the syringe controls the flow of coating material
9 to the roller assembly.

10
11 (015) The novel features which are believed to be characteristic of the
12 invention, both as to its organization and method of operation, together, with
13 further objects and advantages thereof, will be better understood from the
14 following description in connection with the accompanying drawings in which
15 the presently preferred embodiments of the invention are illustrated by way of
16 examples. It is to be expressly understood, however, that the drawings are for
17 purposes of illustration and description only and are not intended as a
18 definition of the limits of the invention.

19 20 **BRIEF DESCRIPTION OF THE DRAWINGS**

21
22 (010) Figure 1 is an exploded view of the roller version of the applicator
23 assembly.

24
25 (011) Figure 2 is a cross-sectional view of the assembly illustrated in Figure 1
26 taken along the line 2-2.

27
28 (012) Figure 3 is a cross-sectional view of the assembly illustrated in Figure 1
29 taken along the line 3-3
30

1 (013) Figure 4 is a view of the assembly shown in Figure 1 applying a
2 coating on a fasteners extending out of the surface of a structure.

3
4 (014) Figure 5 is a top view of the assembly shown in Figure 1 applying a
5 coating to a series of fasteners protruding from a structure.

6
7 (015) Figure 6 is a perspective view of a second embodiment applying a
8 coating to a fastener in a corner of a structure.

9
10 (016) Figure 7 is a perspective view of the applicator assembly shown in
11 Figure 1 incorporating a syringe for supplying the coating material directly to
12 the applicator.

13
14 (019) Figure 8 is an enlarged partial cross-sectional view of Figure 7 taken
15 along the line 8-8 illustrating the nozzle configuration of the syringe.

16
17 (020) Figure 9 is a partially broken away side view of a self-powered version
18 of the applicator assembly.

19
20 **DESCRIPTION OF THE PREFERRED EMBODIMENT**

21
22 (021) Referring to Figures 1-3, the first embodiment of the coating applicator
23 is in the form of a roller assembly, generally designated by numeral 10, The
24 roller assembly includes a U shaped support frame 12 having a center leg 14
25 connected at one end to a side leg in the shape of a rod 16 acting as an axle.
26 The rod 16 includes a flange 20 and a threaded end 18. A roller member 22 is
27 rotatably mounted on the rod 16 retained thereon by flange 20 and a nut 24
28 engaging the threaded end 18. The roller member 22 includes a sleeve 26
29 having a hole 27 through which the rod 16 extends. Bonded to the exterior of
30 the sleeve 26 is a foam coating applicator 28, which will be subsequently

1 discussed in detail. Also attached to the center leg is a second side leg 32,
2 which bends 90 degrees at its middle portion 34 and terminates in a threaded
3 end 36. A handle 38 having an internally threaded end 40 is attached thereby
4 to the threaded end 36. Thus the roller assembly so far described is
5 conventional in design and other methods of attachment of the roller member
6 22 can be used.

7
8 (022) Particularly referring to Figures 2 and 3, the foam coating applicator 28
9 is designed to easily imbibe the coating material and coat fasteners 42
10 installed in structures such as plate assembly 44. The fastener ends 46
11 protrude out of the plate assembly 44 with a height 47 and are secured by nuts
12 48. In order to properly coat the fastener ends 46 with a minimum of coating
13 material, the peripheral end 50 of the foam coating applicator 28 has a W
14 shape. The center V shaped notch 52 has a depth 54 and an included angle
15 56. The outer sides 58A and 58B are at acute angles 60A and 60B,
16 respectively, leaving only small contact edges 62A and 62B.

17
18 (023) In order to insure that the fastener ends 46 are properly coated in a one
19 or two passes of the roller assembly 10, the applicator 28 should have the
20 following dimensions:

- 21 1. Depth 54 of groove 52 is between 60 to 70 percent of fastener height 47;
- 22 2. Angle 56 is between 40 and 50 degrees;
- 23 3. Angles 60A and 60B between 40 and 50 degrees; and
- 24 4. Depth 61 of coating applicator is greater than 4 times the depth of the 54 of
25 the groove 52.
- 26 5. Width 63 of coating applicator is not critical, but must be sufficient to
27 prevent collapse upon application of the coating material.

28 The foam should be open celled foam having a density of between 2 to 3
29 pounds per cubic foot. As previously stated, during coating, such a
30 configuration will allow the coating member to deform sufficiently to

1 completely engulf the fastener end and nut insuring that the imbibed coating
2 material completely coats the fastener end and nut. Suitable foam is sold
3 under the trade name Artilon[®], manufactured by Youngbo America
4 Incorporated, Huntington Beach, California.

5

6 (024) As illustrated in Figures 4 and 5, when the roller 10 is pressed down
7 over the fastener ends 46, the roller applicator 28 flattens such the notch 52
8 deforms about the fastener end 46 causing any imbibed coating material to
9 completely coat the fastener end. Because only the flattened contact edges
10 62A and 62B remain in contact with the plate 44 between fasteners little
11 coating material is deposited between the fasteners as indicated by numeral
12 64 in Figure 5. Tests have demonstrated that's other shapes, such as notch
13 or semicircle or 90 V do not work.

14

15 (025) A second embodiment is illustrated in to Figure 6. Here the applicator
16 assembly, generally indicated by numeral 70, is shown coating a fastener 72 in
17 a corner of a structure 74. The applicator assembly 70 includes a simple
18 handle 76 having a plate 77 at end 78. A block of foam 80 with a W shaped
19 surface 82 is bonded to the plate 77. It is obvious that this applicator
20 assembly 70 is ideally suited for such situations where a roller assembly could
21 not be effectively used.

22

23 (026) The applicator assembly illustrated in Figure 1-4 can be improved by
24 incorporating a coating material reservoir. Referring to Figure 6 and 7, a
25 coating applicator 10A is depicted that is similar to coating applicator 10
26 except in the design of the support frame, now indicated by numeral 83.
27 Here the support frame 83 includes a handle 84 having first and second
28 ends 85A and 85B respectively. First and second U shaped spring clips 86A
29 and 86B are mounted on the first and second ends 85A and 85B of the
30 handle 84. Each of the U shaped spring clips includes side legs 87A and

1 87B. The support frame 83 includes a center leg 88 that has a first portion
2 88A that is bent side ways and second portion 88B that is bent downward
3 and joins to a rod 89, which serves as an axle for the roller member 22.
4

5 (027) A syringe 90, preferably made of plastic material is used as a coating
6 material reservoir. A 10 cubic centimeter capacity is ideal because it has an
7 adequate capacity and can still be operated with one hand. The syringe 90
8 includes a hollow body 94 with an open first end 96 and closed off second
9 end 98. The first end 96 of the plunger 100 incorporates flanges 101A and
10 101BA plunger 100 is movably mounted in the open first end 96. The
11 plunger 100 has a seal 102 at end 104 within the body 94. Typically, the
12 syringe is filled with a two-part coating 106 comprising a resin and catalyst
13 mixed together. However, other coating materials can be used. The closed
14 off second end 98 has a threaded hole 107 therein, in which a needle (not
15 shown) would be normally installed. The syringe 90 includes a nozzle 108,
16 which will be subsequently discussed. The syringe 90 is installed by
17 pushing the body 94 of the syringe into engagement with the first and
18 second U shaped members 86A and 86B such that the flanges 101A and
19 101B contact end 85A of the handle 83. Thereafter, the body 94 is pressed
20 down until the legs 87A and 87B of both U shaped 86A and 86B lock the
21 syringe in place. Other attachment methods are usable, such as just taping
22 to the handle.
23

24 (028) The nozzle 108 has an externally threaded end 112, which engages the
25 threaded hole 107. The length 114 of the nozzle 108 as well as its shape is
26 such that the outlet port 116 is within the notch 52 of the roller member 22 and
27 is aligned with the axis of rotation thereof. Thus coating material 106 can be
28 applied to the roller member 22 by pressing the plunger 100, which forces the
29 coating material on to the W shaped peripheral end 50. As previously stated,
30 the advantage of syringe is that coating material remains within the syringe

1 until applied. With the original applicator assembly, a paint tray was
2 necessary. This exposed the operator and any other individuals near by to
3 fumes and possible contact with coating material when handling the tray or
4 pouring coating material therein. Furthermore, the surface of the coating
5 material in the tray tends to cure rapidly when exposed to air. The syringe 90
6 once loaded with a two part coating material can be stored at low-
7 temperatures providing a shelf life of up to six months. This is advantageous,
8 since a large number of syringes could be prepared at one time.

9
10 (029) A third version of the applicator assembly is illustrated in Figure 9,
11 generally indicated by numeral 10B. The Applicator assembly 10B includes a
12 syringe 120 that includes an open first end 122 having a flange 123 and a
13 closed off second end 124 having an aperture 126 therein. The syringe 120
14 includes a twist on cap 130, which locks on to the flange 123. A piston 131 is
15 movably mounted within the syringe 120 biased toward the second end 124 by
16 spring 132 positioned between it and the cap 130. Thus coating material 23 is
17 pushed toward the aperture 126. A valve 135 includes a body 136
18 incorporating a plastic tube 137. A handle 138 is pivotally mounted to the
19 body 136 and rotates about pivot axis 140. The handle 138 is biased by
20 spring 142 such that the protrusion 144 on the handle normally crimps the
21 tube 137 closing it off. When the handle 138 is pushed toward the body 136
22 the protrusion 144 disengages from the tube 137 allowing flow through output
23 port 146.

24
25 (030) The output port 146 of the valve 135 is connected to the nozzle 108,
26 which applies coating material to the applicator 28 of the roller assembly 22.
27 The applicator assembly 22 is rotatably mounted to arm 148 connected to the
28 valve 135. This embodiment, with automatic feed can more easily operated
29 with one hand. The particular valve 135 has been shown for purposes of
30 illustration only, and there are numerous other types of valves that can be

1 used. The valve depicted is a TS102D Dispensing Pen, manufactured by
2 Techcon Systems, Garden Grove, California.

3

4 (032) While the invention has been described with reference to particular
5 embodiments, it should be understood that the embodiments are merely
6 illustrative, as there are numerous variations and modifications, which may be
7 made by those skilled in the art. Thus, the invention is to be construed as
8 being limited only by the spirit and scope of the appended claims.

9

10 **INDUSTRIAL APPLICABILITY**

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12 (031) The invention has applicability to the paint industry.